

Claims

We claim:

5 1. An isolated polynucleotide encoding an oxalate decarboxylase enzyme of
Aspergillus or *Bacillus subtilis*.

 2. The polynucleotide according to claim 1, wherein said polynucleotide encodes an
oxalate decarboxylase enzyme comprising the amino acid sequence shown in SEQ ID NO. 3, or
10 an enzymatically active fragment thereof.

 3. The polynucleotide according to claim 1, wherein said polynucleotide encodes an
oxalate decarboxylase enzyme comprising the amino acid sequence shown in SEQ ID NO. 4, or
an enzymatically active fragment thereof.

15 4. The polynucleotide according to claim 1, wherein said polynucleotide encodes an
oxalate decarboxylase enzyme comprising the amino acid sequence shown in SEQ ID NO. 9, or
an enzymatically active fragment thereof.

20 5. The polynucleotide according to claim 1, wherein said polynucleotide comprises
the nucleotide sequence shown in SEQ ID NO. 2, or a fragment thereof encoding an
enzymatically active oxalate decarboxylase.

 6. The polynucleotide according to claim 1, wherein said polynucleotide comprises
25 the nucleotide sequence shown in SEQ ID NO. 1, or a fragment thereof encoding an
enzymatically active oxalate decarboxylase.

 7. A cell, or progeny thereof, transformed with a polynucleotide of claim 1.

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8. The cell according to claim 7, wherein said cell is a bacterial cell, animal cell, or plant cell.

9. The cell according to claim 7, wherein said cell is lyophilized or frozen.

10. A transgenic animal comprising a polynucleotide of claim 1 incorporated into the genome of said animal.

11. A transformed or transgenic plant comprising a polynucleotide of claim 1.

12. The plant according to claim 11, wherein said plant is a monocotyledonous plant.

13. The plant according to claim 12, wherein said monocotyledonous plant is selected from the group consisting of rice, wheat, barley, oats, rye, sorghum, maize, lilies, and millet.

14. The plant according to claim 11, wherein said plant is a dicotyledonous plant.

15. The plant according to claim 14, wherein said dicotyledonous plant is selected from the group consisting of peas, alfalfa, chickpea, chicory, clover, kale, lentil, prairie grass, soybean, tobacco, potato, sweet potato, radish, cabbage, rape, apple trees, and lettuce.

16. A purified oxalate decarboxylase enzyme of *Aspergillus* or *Bacillus subtilis*.

17. The enzyme according to claim 16, wherein said enzyme comprises the amino acid sequence shown in SEQ ID NO. 3, or an enzymatically active fragment thereof.

18. The enzyme according to claim 16, wherein said enzyme comprises the amino acid sequence shown in SEQ ID NO. 4, or an enzymatically active fragment thereof.

19. The enzyme according to claim 16, wherein said enzyme comprises the amino acid sequence shown in SEQ ID NO. 9, or an enzymatically active fragment thereof.

20. The enzyme according to claim 16, wherein said enzyme is attached to a solid surface.

21. A method for degrading oxalate in a fluid, comprising contacting said fluid with an oxalate decarboxylase enzyme of claim 16.

22. The method according to claim 21, wherein said oxalate decarboxylase enzyme comprises the amino acid sequence shown in SEQ ID NO. 3, or an enzymatically active fragment thereof.

23. The method according to claim 21, wherein said oxalate decarboxylase enzyme comprises the amino acid sequence shown in SEQ ID NO. 4, or an enzymatically active fragment thereof.

24. The method according to claim 21, wherein said oxalate decarboxylase enzyme comprises the amino acid sequence shown in SEQ ID NO. 9, or an enzymatically active fragment thereof.

25. The method according to claim 21, wherein the fluid is blood or urine.

26. The method according to claim 21, wherein said oxalate decarboxylase enzyme is attached to a solid surface.

27. A pharmaceutical or nutraceutical composition comprising:

a) an oxalate decarboxylase enzyme of claim 16; or

b) a cell of claim 7; or

c) both an oxalate decarboxylase enzyme of claim 16 and a cell of claim 7.

28. The composition according to claim 27, wherein said oxalate decarboxylase enzyme or said cell is lyophilized or frozen.

5 29. The composition according to claim 27, wherein said oxalate decarboxylase enzyme or said cell is encapsulated in a gel capsule or other form providing enteric protection.

30. The composition according to claim 29, wherein said gel capsule or other form is resistant to degradation by stomach enzymes or acids but is degradable by contents within a
10 human or animal intestinal tract.

31. A device comprising a surface that comes into contact with a fluid that may contain oxalate, wherein attached to said surface of said device is an oxalate decarboxylase enzyme of claim 16.
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32. The device according to claim 31, wherein said oxalate decarboxylase enzyme comprises the amino acid sequence shown in SEQ ID NO. 3, SEQ ID NO. 4, SEQ ID NO. 9 or an enzymatically active fragment thereof.

20 33. The device according to claim 31, wherein said device is a catheter, a stent, or a dialysis cartridge.

34. A method for detecting the presence of oxalate in a sample, said method comprising contacting said sample with an oxalate decarboxylase enzyme of claim 16, and then
25 assaying for the production or presence of carbon dioxide or formate.

35. The method according to claim 34, wherein said oxalate decarboxylase enzyme comprises the amino acid sequence shown in SEQ ID NO. 3, SEQ ID NO. 4, SEQ ID NO. 9, or an enzymatically active fragment thereof.
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36. A method for providing therapeutic oxalate degradation to a human or animal in need of therapy, said method comprising administering to said human or said animal an effective amount of a pharmaceutical or nutraceutical composition comprising:

- a) an oxalate decarboxylase enzyme of claim 16; or
- b) a cell of claim 7; or
- c) both an oxalate decarboxylase enzyme of claim 16 and a cell of claim 7.

37. The method according to claim 36, wherein said composition is administered as a constituent of a meal or animal feed.

38. The method according to claim 36, wherein said composition is administered by allowing said animals to graze and feed upon a plant transformed with a polynucleotide encoding said oxalate decarboxylase enzyme, wherein said plant is expressing said enzyme.

39. The method according to claim 36, wherein said animal is a domesticated, agricultural, zoo-maintained, or circus-maintained animal.

40. The method according to claim 39, wherein said domesticated animal is selected from the group consisting of dog, cat, rabbit, ferret, guinea pig, hamster, pig, monkey, and gerbil.

41. The method according to claim 39, wherein said agricultural animal is selected from the group consisting of horse, mule, donkey, burrow, cattle, cow, pig, sheep, and alligator.

42. The method according to claim 39, wherein said zoo- or circus-maintained animal is selected from the group consisting of lion, tiger, bear, camel, giraffe, hippopotamus, and rhinoceros.

43. A method for producing a plant of claim 11, comprising introducing a polynucleotide of claim 1 into a plant cell, and growing a plant from said cell.